

REMARKS

Allowed Claims

The allowance of claims 4, 5, 9-11, 13, 14, 27 and 37 is acknowledged with appreciation.

Allowable Claims

The indication that each of claims 16, 18, 20, 30 and 31 would be allowed if rewritten in independent form is acknowledged with appreciation.

Since in the prior Response of April 10, 2008, claim 16 was rewritten in independent form (and is still in independent form), in response to the indication of January 28, 2008 that these claims were allowable if rewritten in independent form, independent claim 16 and claims 18, 20, 30 and 31 ultimately dependent on claim 16 are believed to now be allowable and such action is requested.

Claim Rejections

The remaining claims were rejected only under §103 in view of various combinations of the cited references. Claims 1, 2, 7, 8, 32, 35, 36, 38 and 39 were rejected only under §103 over Reef in view of Fournier. Claims 3, 15, 17, 19, 21, 23, 25, 26, 28, and 29 were rejected only under §103 over Reef in view of Fournier and Rich. Claims 6 and 8 were rejected only under §103 over Reef in view of Fournier and Itatsu.

Telephone Interview

In a telephone interview on July 30, 2008, Examiner Davis D. Hwu and applicants' attorney William Francis discussed the interpretation set forth below of the Reef and Fournier references, how this interpretation differs from that set forth in the Office Action of January 28, 2008 and the interpretation of the language of claim 1 with respect to these references. The Examiner explained his view that the language of claim 1 reads on the prior art references and no agreement was reached with respect to claim 1 or any of the other rejected claims.

Reef U.S. Patent 5,667,366

Reef discloses a fuel pump module for a return type fuel system in which a high pressure pump 14 supplies its entire output of high pressure fuel directly to an engine through a conduit 18. Excess fuel not consumed by the engine passes through a pressure regulator on the engine fuel rail and is returned at a low pressure and a varying flow rate or volume depending on the engine fuel demand through a line 20 to a jet pump 10 which discharges this low pressure return fuel along with fuel 24 entrained from the fuel tank 12 into a reservoir 16 in which the high pressure pump 14 and its inlet is received. With this system, excess low pressure return fuel actuates the jet pump 10 and the jet pump delivers a minimum quantity of fuel and sometimes no fuel into the reservoir 16 during peak fuel demand of the engine which is precisely the time when the maximum quantity of fuel should be supplied to the relatively small reservoir 16 because it is being emptied at the maximum rate by the peak fuel demand of the engine.

As stated at Col 4, Line 64 to Col 5, Line 3, the return line maximum pressure will be 1.2 to 1.5 bars and the return fuel flow to the venturi will be as low as 20 liters/hr and as high as 180

liters/hr. In contrast, in applicants' system, the high pressure pump supplies fuel to the jet pump at a relatively constant pressure typically in the range of 4-5 bar and at a substantially constant and low flow rate typically in the range of about 20 to 30 liters/hr.

Contrary to the contention in the Office Action, Reef does not disclose any of the high pressure fuel output of the pump 14 being supplied to the jet pump 10 but rather low pressure fuel at a significantly varying flow rate of the unconsumed excess fuel discharged by the pressure regular downstream of the engine fuel injectors.

As acknowledged in the Office Action, Reef does not disclose any restrictor plate at all.

Fournier U.S. Patent 5,647,328

Fournier discloses a fuel pump module 10 with a high pressure electric fuel pump 14 with an outlet 20 through which it supplies high pressure fuel to an engine through a conduit 24. Both the high pressure fuel pump 14 and its inlet 16 are outside of a reservoir 26. The pressure of the high pressure fuel supplied to the engine is controlled, regulated and maintained substantially constant by a pressure regulator 22 which discharges at a low pressure excess fuel (not consumed by the engine) through its outlet 28 into the canister 26 at substantially atmospheric pressure. The bottom of the reservoir has an orifice 90 sized so that the canister will be substantially completely filled with fuel discharged from the outlet 28 through the pressure regulator during normal operation of the pump with minimum overflow of fuel over the open top of the canister and back into the main fuel tank (Col 10, Lines 8-23). Fuel flowing through the orifice 28 enters the filter 18 and may flow to the inlet 16 of the operating high pressure pump. Fournier does not have any jet pump at all.

Contrary to the contention in the Office Action,

1. the pressure regulator bypass outlet 28 is not a nozzle of a jet pump if the English language means anything at all;
2. Fournier does not disclose or teach any jet pump at all or any jet pump nozzle supplying fuel to the reservoir;
3. Does not disclose any high pressure fuel pump inlet 16 in the reservoir 26;
4. Does not disclose any restrictor plate 30 between the outlet 20 of the high pressure fuel pump and the inlet of any jet pump nozzle, rather it simply discloses a restrictor plate 30 in the bottom of the reservoir through which flows into the filter 18, some of which may enter the inlet of the high pressure pump.

Rich U.S. Patent 5,070,849

Rich discloses a fuel pump module 10 with a high pressure electric fuel pump 22 received in a closed reservoir 20 and supplying high pressure fuel to both a vehicle engine and through tube 62 to a jet pump 38 which discharges fuel into the closed reservoir. In operation, the jet pump entrains fuel from either the fuel tank 12 or when the reservoir is full recirculates fuel in the reservoir 20 through a valve housing 64, conduit 70 and an inlet 72 in the jet pump.

Contrary to the contention in the Office Action, Rich does not disclose, suggest or teach:

1. a high pressure fuel pump 38, but rather a high pressure pump 22 with an inlet 24 and an outlet 26;

2. an inlet of the high pressure pump from a hose 62, but rather high pressure pump 22 with an inlet 24; or
3. a return line 62, but rather line 62 supplies fuel to the jet pump to operate it.

As acknowledged in the Office Action, Rich does not disclose any restrictor plate or orifice at all.

Itatsu U.S. Patent 6,708,904

Itatsu discloses an internal combustion engine fuel injector 1 for atomizing liquid fuel with a discharge nozzle 5 having three plates 51, 52, 53, each with holes therein. Inlet plate 51 has two spaced-apart holes 51a each with an axis parallel to the nozzle axis L1, outlet plate 53 has two outlet holes 53a each with an axis inclined to the nozzle axis L1 and located radially inboard of the inlet holes 51a, and plate 52 has two elongate slots 52a communicating the inlet holes with the outlet holes. This configuration of holes provides extremely turbulent flow multiplying or increasing the atomization effect on the fuel flowing through the injector (Col 2, Line 58-65).

Rejection of Claims 1 & 35

In the current Office Action, independent claims 1 and 35 were rejected only under §103 as being unpatentable over Reef in view of Fournier.

Amended Claim 1

As amended herein, claim 1 defines a fuel pump module for a fuel tank having, among other things, a high fuel pressure pump with a high pressure fuel outlet supplying high pressure fuel to an engine, a jet pump having a jet nozzle with an outlet and an inlet connected through a conduit with the high pressure fuel outlet of the fuel pump upstream of the engine for high

pressure fuel flow through the jet pump nozzle to discharge entrained fuel into the reservoir, and at least one restrictor plate received in the conduit between the high pressure fuel pump upstream of the engine and the inlet of the jet nozzle with an orifice upstream of the inlet of the jet nozzle and restricting the flow of high pressure fuel from the high pressure pump through the inlet of the jet nozzle.

Claim 1 has been amended to obviate the Examiner's contention expressed in the telephone interview that the "fluid communication" terminology of the previously submitted claim 1 encompassed the combination of the Fournier and Reef references even though the Fournier reference has no jet pump at all and in Reef the jet nozzle of its jet pump is not connected to the high pressure fuel pump and is not operated by high pressure fuel.

Claim 1 is Patentable

Neither applicants' specific concept, construction and arrangement as defined in amended claim 1, nor its significant practical advantages, are taught or made obvious to persons of ordinary skill in view of the proposed combination of the Reef and Fournier references for at least the following reasons.

Neither reference recognizes or discloses the problem solved by applicants' invention of increasing the supply of fuel to the engine (which during cold weather start-up of the engine and warm-up of the engine are in critical) and of improving the efficiency and maximum quantity of fuel delivered to the engine by the electric fuel pump module without increasing the size and/or maximum output capacity of the high pressure electric fuel pump nor provides any solution to these problems, much less applicants' solution and specific construction and arrangement as defined by amended claim 1. Reef discloses a construction in which the jet pump is connected to

a line returning the unused fuel from the engine which is at a low fuel pressure of about 1.2 to 1.5 bar and has a highly variable flow rate from less than 20 liters per hour to as much as 180 liters per hour (Col 4, Line 64-Col 5, Line 3). Indeed during cold weather start-up, it may have no fuel flow to its jet pump. Reef does not have any restricted orifice at all. Fournier does not have any jet pump at all and it does not have any orifice restricting the supply of fuel to any jet pump. Therefore, the proposed combination of Reef and Fournier does not disclose, suggest or teach to skilled persons applicants' specific construction as defined by amended claim 1 in which an outlet of high pressure fuel from the electric motor high pressure fuel pump is connected upstream of the engine by a conduit to the inlet of a jet pump to supply high pressure fuel to the jet pump and a restrictor plate with an orifice is disposed in the conduit upstream of the jet nozzle to restrict the flow of high pressure fuel from the outlet of the high pressure pump through the inlet of the jet nozzle of the jet pump.

Indeed, the proposed combination of Reef and Fournier teaches away from applicants' invention by simply modifying Reef to have an orifice in the bottom of its reservoir to supply returned reserve fuel from inside the canister to the inlet of the high pressure electric pump located outside of the reservoir. Clearly, if viewed without hindsight, the combination of these references does not disclose, suggest or teach to persons of ordinary skill the problem solved by applicants, any solution to this problem, applicants' specific construction and arrangement as defined by amended claim 1 nor its significant practical advantages all of which are part of the subject matter as a whole which must be considered in determining non-obviousness under §103. For these same reasons, it appears that the proposed combination of the Reef and Fournier references has been made utilizing the teachings of applicants' invention which use of hindsight is

explicitly precluded in determining non-obviousness under §103. Accordingly, for at least these reasons, amended claim 1 defines patentable subject matter and should be allowed.

In contrast, in applicants' invention as defined by amended claim 1, the jet nozzle of the jet pump is connected to a high pressure fuel outlet of the electric pump upstream of the engine by a conduit in which a plate with a restrictor orifice is received between the pump upstream of the engine and upstream of the jet nozzle of the jet pump to supply a very small quantity of high pressure fuel at a small and relatively constant flow rate to the inlet of the jet nozzle of the jet pump to entrain fuel from the tank and discharge it into the reservoir. This high pressure fuel typically at a pressure about 4 to 5 bar and has a substantially constant low flow rate typically in the range of about 20 to 30 liters per hour.

Claims 2, 3, 6, 7 & 8

Each of claims 2, 3 and 6-8 is ultimately dependent on amended claim 1 and hence defines patentable subject matter and should be allowed for at least the foregoing reasons.

Independent Claim 15

Independent claim 15, and claims 17, 19, 21, 23, 25, 26, 28 and 29, dependent thereon, were rejected only under §103 as being unpatentable over Reef in view of Fournier and Rich. Rich was cited as simply disclosing a jet pump having a "venturi 6c axially spaced between the nozzle and the inlet of the reservoir".

Amended Claim 15 is Patentable

As amended, independent claim 15 defines a fuel transfer arrangement for transferring fuel from one portion to another of the fuel tank having, among other things, a source of high pressure fuel with an inlet in one portion of the fuel tank and an outlet of high pressure fuel supplied to an engine, a jet pump with an inlet in another portion of the fuel tank spaced from the one portion of the fuel tank and the fuel inlet of the source, a nozzle of the jet pump having an inlet connected to the outlet of the source of high pressure fuel upstream of the engine for receiving high pressure fuel from the source and a restrictor plate with an orifice connected by a conduit with the high pressure fuel outlet of the source and the inlet of the nozzle of the jet pump and axially spaced upstream of the nozzle to restrict the flow of high pressure fuel to the nozzle, and a first venturi having an inlet communicating with the another portion of the fuel tank and with the outlet of the jet pump nozzle to receive fuel discharged from the nozzle to cause fuel to move from the another portion of the fuel tank into the first venturi.

Amended Claim 15 is Patentable

As amended herein, claim 15 defines non-obvious subject matter under §103 and should be allowed for at least the foregoing reasons for which amended claim 1 does so. Furthermore, the proposed combination of Reef, Fournier and Rich does not have the construction and arrangement as defined by amended claim 15 which transfers fuel from one portion of a fuel tank to another portion of the fuel tank spaced from such one portion of the tank. Accordingly, for this additional reason alone, independent claim 15 also defines patentable subject matter under §103 over this proposed combination of references and should be allowed.

Dependent Claims 17, 19, 21, 23, 25, 26, 28 & 29

Each of claims 17, 19, 21, 23, 25, 26, 28 and 29 is ultimately dependent on amended claim 15 and hence defines patentable subject matter for at least the foregoing reasons for which claim 15 does so and should be allowed.

Claim 32 is Patentable

As amended, independent claim 32 is believed to define patentable subject matter over the Reef and Fournier references for at least the foregoing reasons for which amended claims 1 and 15 do so and should be allowed.

Claim 39 is Patentable

Claim 39 is directly dependent on claim 32 and further defines the nozzle and defines patentable subject matter for at least the reasons for which claim 32 does so and should be allowed.

Claim 35 is Patentable

As amended, claim 35 defines an arrangement for transferring fuel in one portion of the tank to another portion of the tank spaced from the one portion and having a source of pressurized fuel supplied to an engine, a jet pump with a nozzle in one portion of the fuel tank and having an inlet connected with the source of pressurized fuel upstream of the engine to receive pressurized fuel, at least one restrictor plate having an orifice connected with the source of pressurized fuel upstream of the engine, between the source and the nozzle of the jet pump, axially spaced upstream from the nozzle inlet and restricting the flow of pressurized fuel to the nozzle and

wherein a pair of orifices communicate with the source of pressurized fuel upstream of the engine and the nozzle.

Accordingly, amended claim 35 defines patentable subject matter for at least the foregoing reasons for which claims 1 and 15 do so. Furthermore, claim 35 calls for a pair of orifices between the source of high pressure fuel upstream of the engine and the nozzle of the jet pump which construction and arrangement is not disclosed, suggested or taught by the proposed combination of the Reef or Fournier references, and hence defines patentable subject matter under §103 for at least this additional reason and should be allowed.

Claims 36 & 38 are Patentable

Each of claims 36 and 38 is ultimately dependent on claim 35 and hence defines patentable subject matter for at least the foregoing reasons for which claim 35 does so and should be allowed.

Conclusion

The allowance of claims 4, 5, 9-11, 13, 14, 27, 307 and the indication that claims 16, 18, 20, 30 and 31 would be allowable if rewritten in independent form is acknowledged with appreciation. Since claim 16 was and is in independent form, claims 16, 18, 20, 30 and 31 should be allowed.

Each of the remaining independent claims has been amended and define patentable subject matter for at least the foregoing reasons and hence all of the remaining rejected claims should be allowed.

If after considering this Response the Examiner is of the view that any of these claims are still not in a condition for allowance, a telephone interview with applicants' undersigned attorney William Francis is requested so that immediate consideration can be given to any further amendments suggested by the Examiner or otherwise needed to place all the claims in a condition for allowance. The Examiner is asked to initiate this interview by telephoning William Francis at 248-689-3500, Ext 153, who normally can be reached Monday through Friday between 9 a.m. and 5 p.m.

Respectfully submitted,

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By



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